The Embedded I/O Company

TAMC002-TM

MTCA.4 Rear-I/O µRTM for TAMC220

Version 1.0

User Manual

Issue 1.0.1

June 2013

TEWS TECHNOLOGIES GmbH

Am Bahnhof 7 25469 Halstenbek, Germany

Phone: +49 (0) 4101 4058 0 Fax: +49 (0) 4101 4058 19

e-mail: info@tews.com www.tews.com

TAMC002-TM-10R

MTCA.4 Rear I/O µRTM for TAMC220, Mid-Size front panel

TAMC002-TM-11R

MTCA.4 Rear I/O µRTM for TAMC220, Full-Size front panel

TEWS TECHNOLOGIES GmbH has made any effort to ensure that this manual is accurate and complete. However TEWS TECHNOLOGIES GmbH reserves the right to change the product described in this document at any time without notice.

TEWS TECHNOLOGIES GmbH is not liable for any damage arising out of the application or use of the device described herein.

Style Conventions

Hexadecimal characters are specified with prefix 0x, i.e. 0x029E (that means hexadecimal value 029E).

For signals on hardware products, an ‚Active Low' is represented by the signal name with # following, i.e. IP_RESET#.

Access terms are described as:

W	Write Only
R	Read Only
R/W	Read/Write
R/C	Read/Clear
R/S	Read/Set

Issue	Description	Date
1.0.0	Initial Issue	November 2011
1.0.1	(1) Technical Specification Table: Deleted Module Current Requirements Record mentioning (2) Zone 3 Interface Compatibility Record: Changed the format of the table to match other TEWS products	June 2013

Table of Contents

List of Figures

List of Tables

!

1 Product Description

The TAMC002-TM is a standard Mid-Size/Full-Size MTCA.4 compliant Micro Rear Transition Module compatible to the TAMC220.

Two AirmaxVS™ connectors provide access to all IP I/O lines of the TAMC220. The I/O lines are routed to three VHD68 SCSI-V 68-pin connectors in the front panel and also to three 50-pin flat cable connectors that may be used for rack internal wiring or laboratory use.

According to MTCA.4, the TAMC002-TM provides an I2C EEPROM and an I2C temperature sensor. An I2C I/O extender device is used to provide various management signals on the µRTM, with the management being handled by the MMC of the TAMC220.

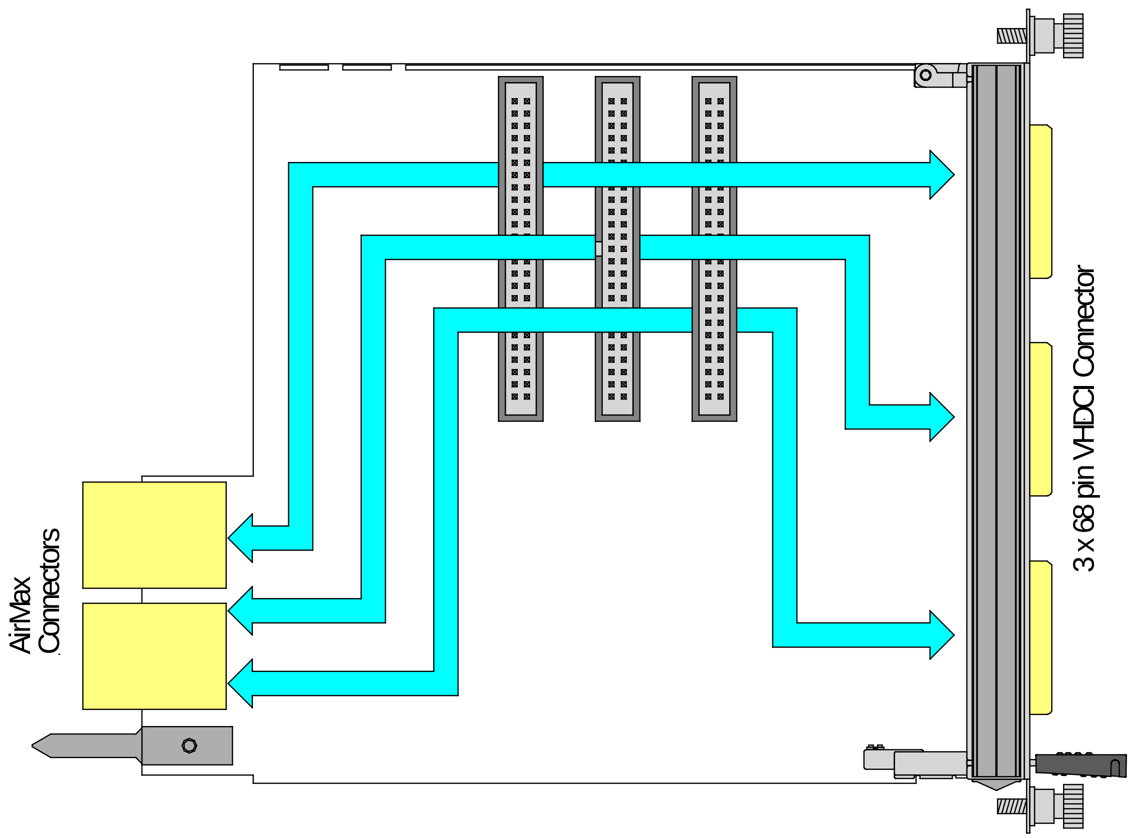


Figure 1-1 : Block Diagram

2 Technical Specification

Module Interface		
Mechanical Interface	MTCA.4 Micro Rear Transition Module conforming to MTCA.4 Module Type: Double Mid-Size Module (-10R) Module Type: Double Full-Size Module (-11R)	
IPMI Support		
IPMI Version	1.5	
Front Panel LEDs (TAMC220 MMC controlled)	Blue Hot-Swap LED Red Failure Indication LED (LED1) Green Board OK LED (LED2)	
Main On-Board Devices		
I2C I/O Extender	PCA9534 (Texas Instruments)	
I2C EEPROM	M24C32 (ST Microelectronics)	
I2C Temperature Sensor	LM75 (National Semiconductor)	
I/O Interface		
Front panel I/O	3 x VHD68 SCSI-V connector, one for each IP slot on the TAMC220	
Onboard I/O	3 x 50-pin flat cable connectors, on for each IP slot on the TAMC220	
Physical Data		
Power Requirements	Management Power: 15mA typical @ +3.3V DC	
	Payload Power: 0A @ +12V DC	
Temperature Range	Operating	-40°C to +85°C
	Storage	-40°C to +85°C
MTBF	448000h MTBF values shown are based on calculation according to MIL-HDBK-217F and MIL-HDBK-217F Notice 2; Environment: G_B 20°C. The MTBF calculation is based on component FIT rates provided by the component suppliers. If FIT rates are not available, MIL-HDBK-217F and MIL-HDBK-217F Notice 2 formulas are used for FIT rate calculation.	
Humidity	5 – 95 % non-condensing	
Weight	200g	

Table 2-1 : Technical Specification

3 Handling and Operating Instructions

3.1 ESD Protection

The µRTM is sensitive to static electricity. Packing, unpacking and all other module handling has to be done in an ESD/EOS protected Area.

3.2 Thermal Considerations

Forced air cooling is recommended during operation. Without forced air cooling, damage to the device can occur.

3.3 Voltage Limits on IndustryPacks

The AMC.0 specification limits the voltages on AMC modules. These limits also apply to mounted IndustryPack Modules and their I/O lines.

Refer to the chapter “Voltage Limits on IndustryPack Modules” for details.

4 IPMI Support

The Front-AMC module provides a Module Management Controller (MMC) that performs health monitoring, hot-swap functionality and stores the Field Replaceable Unit (FRU) information. The MMC communicates via an Intelligent Platform Management Interface (IPMI) with superordinated IPMI controllers.

The TAMC002-TM is controlled by the Front-AMCs MMC. It provides a temperature sensor, FRU information and management signals for hot swap handle status and LED control.

4.1 Temperature and Voltage Sensors

The MMC on the TAMC220 monitors sensors onboard the TAMC002-TM and signals sensor events to the superordinated IPMI controller / shelf manager. Available sensors are listed in the table below.

Sensor Number	Signal Type	Thresholds	Signal Monitored
0	Event	-	Hot-swap switch
1	Temperature	lnr lcr lnc unc ucr unr	LM75

Table 4-1 : Temperature and Voltage Sensors

unr: upper non-recoverable, ucr: upper critical, unc: upper non-critical
lnr: lower non-recoverable, lcr: lower critical, lnc: lower non-critical

4.2 FRU Information

The TAMC002-TM stores the module FRU information in a non-volatile EEPROM. The actual FRU information data is shown below.

Area	Size (in Bytes)	Writeable
Common Header	8	no
Internal Use Area	0	no
Chassis Info Area	0	no
Board Info Area	variable	no
Product Info Area	variable	no
Multi Record Area		
Zone 3 Interface Compatibility Record	variable	yes

Table 4-2 : FRU Information

4.2.1 Board Info Area

Product Information	Value
Version	1
Language Code	0x00 - English
Manufacturer date/time	determined at manufacturing
Board manufacturer	TEWS TECHNOLOGIES GmbH
Board product name	TAMC002-TM
Board serial number	determined at manufacturing (see board label)
Board part number	TAMC002-TM-xxR (xx = 10 / 11)

Table 4-3 : Board Info Area

4.2.2 Product Info Area

Product Information	Value
Version	1
Language Code	0x00 - English
Product manufacturer	TEWS TECHNOLOGIES GmbH
Product name	TAMC002-TM
Board part/model number	TAMC002-TM-xxR (xx = 10 / 11)
Product version	V1.0 Rev.A (see board label)
Product serial number	determined at manufacturing (see board label)
Asset tag	= Product serial Number

Table 4-4 : Product Info Area

4.2.3 Multi Record Area

4.2.3.1 Zone 3 Interface Compatibility Record

Parameter		Setting
Type of Interface Identifier		**0x3** OEM Interface Identifier
Interface Identifier Body	Manufacturer ID (IANA)	**0x0071E3** TEWS Technologies Private Enterprise Number
	OEM defined Interface Designator	**0x8DC00000** (0x8 = TAMC, 0xDC = 220)

Table 4-5 : µRTM FRU Zone 3 Interface Compatibility Record

If the Zone 3 Interface Compatibility record matches the Zone 3 Interface Compatibility record in the TAMC220, the TAMC220 considers the µRTM to be compatible. Otherwise, the TAMC220 considers the µRTM to be incompatible.

The Zone 3 Interface Compatibility records are considered as matching if the records are the same length and are identical from offset 9 to the end of the record. Otherwise the record is considered as not matching.

5 Functional Description

5.1 JTAG

The TAMC002-TM has no JTAG capable devices onboard; it just connects TDI with TDO, so that it does not break the TAMC220 JTAG chain. TCK and TMS are left unconnected.

5.2 TCLKA and TCLKB

TCLKA and TCLKB are routed to a 10-pin flat cable header on the TAMC002-TM. On the TAMC220, these two signals are converted from bidirectional M-LVDS signals to single-ended signals, each with a corresponding direction signal. The signal standard for all four single-ended signals on the µRTM is LVTTL.

The direction signals have to be driven by the TAMC002-TM test setup. The user has to make sure that these signals have a valid level if the TCLKx signals are used.

TCLKx_DIR Signal Level	**TCLKx** Direction from µRTM point of view
0	Input to TAMC002-TM
1	Output of TAMC002-TM

Table 5-1 : TCLKx and direction signals

For the pin assignment of these signals, please see the chapter "I/O Connectors".

5.3 I2C Bus

The TAMC002-TM implements the following I2C devices / addresses on the µRTM I2C management bus:

Device Type	**Device**	**I2C Address**	
EEPROM	AT24C32	50h	1010000b
Temperature Sensor	LM75	48h	1001000b
8-Bit I2C I/O Port	PCA9534	20h	0100000b

Table 5-2 : µRTM I2C Devices

The following figure shows the I2C bus on the TAMC002-TM:

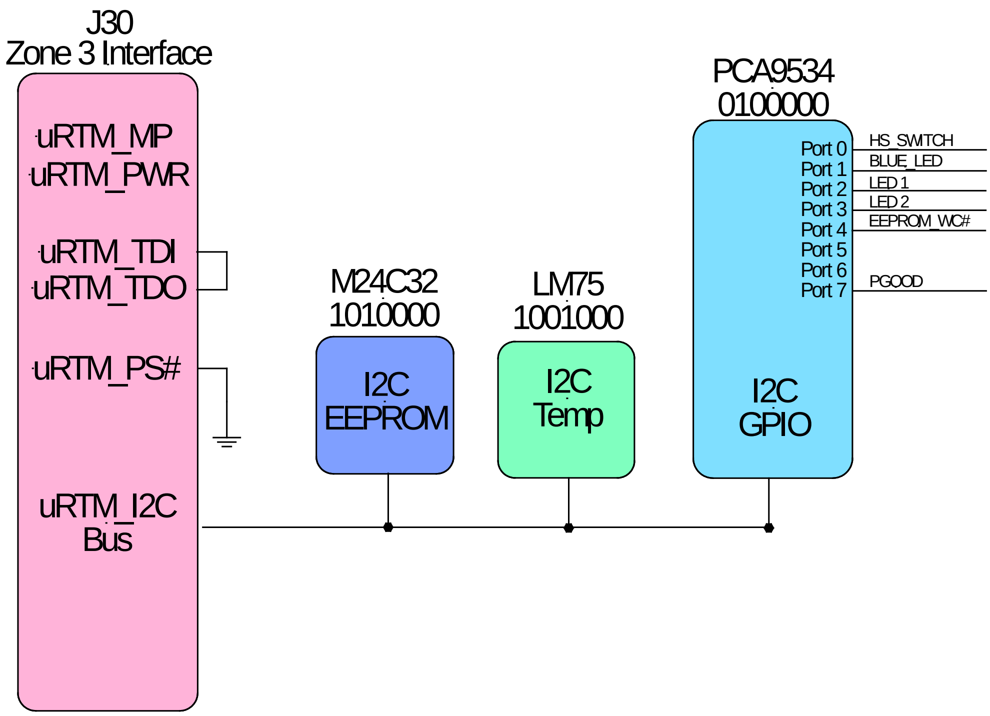


Figure 5-1 : I2C Bus

5.3.1 EEPROM

The EEPROM contains the FRU information for the µRTM module as described in chapter "IPMI Support". The EEPROM I2C address is 50h (1010000b).

5.3.2 Temperature Sensor

The Temperature Sensor I2C address is 48h (1001000b).

5.3.3 I2C I/O Extender

The µRTM provides an 8-Bit I2C I/O Extender device on the I2C management bus that is used for controlling certain management signals on the µRTM. The device I2C address is 20h (0100000b).

The TAMC002-TM implements the following pin/signal assignment for the µRTM I2C I/O Extender device:

I/O Port Bit	I/O Direction	Description
7	**I**	**Payload Power Supply Status** 0 = Payload Power Supply status is not Good 1 = Payload Power Supply status is Good
6	**-**	-
5	**-**	-
4	**O**	**EEPROM Write Protect Control** 0 = EEPROM write protection not active 1 = EEPROM write protection active
3	**O**	**LED2 (Green) Control** 0 = LED off 1 = LED on
2	**O**	**LED1 (Red) Control** 0 = LED off 1 = LED on
1	**O**	**Hot Swap LED (Blue) Control** 0 = LED off 1 = LED on
0	**I**	**Handle Status** 0 = Handle/Switch closed 1 = Handle/Switch open

Table 5-3 : µRTM I2C I/O Extender Port Assignment

6 Installation

This chapter contains general notes regarding installing the µRTM into a system.

6.1 IP Modules on the TAMC220

6.1.1 IP I/O Interface

All pins of the IP slot I/O connectors are routed from the AirmaxVS™ connectors to both the flat cable connectors and the VHD68 SCSI-V connectors in the front panel.

The maximum current rating if the VHD68 SCSI-V connectors are used is 0.3A per pin.

The maximum current rating if the 50-pin flat cable connectors are used is 0.5A per pin.

Please note, that the maximum current rating of the VHD68 SCSI-V connectors is 0.3A!

6.2 µRTM Installation

During insertion and extraction, the operational state of the µRTM is visible via the blue LED in the µRTM front panel. The following table lists all valid combinations of Hot-swap handle position and blue LED status, including a short description of what's going on.

Blue LED / Handle	On	Off	Long Blink	Short Blink
Open (Pulled out)	Extraction: Module can be extracted Insertion: Module is waiting for closed Handle	Module is waiting for hot swap negotiation	-	Hot swap negotiation in progress (Extraction)
Closed (Pushed all way in)	Module is waiting for hot swap negotiation	Module is active (operating)	Hot swap negotiation in progress (Insertion)	-

Figure 6-1 : Hot-Swap states

6.2.1 Insertion

Typical insertion sequence:

1. Insert the µRTM into its slot, with the board edges aligned to the card guides
2. Fasten the screws of the front plate, so the module cannot be pushed out by the Front-AMC if it is inserted afterwards
3. Make sure that the module handle is pushed into the inserted position
    a. Blue LED turns “ON.” (Module is ready to attempt activation by the system)
    b. Blue LED starts “Long Blink” (Hot Swap Negotiation / Module activation in progress)
    c. Blue LED turns “OFF”, and green LED turns “ON” (Module is ready and powered)

When the Blue LED does not go off but returns to the “ON” state, the µRTM FRU information is incompatible to the Front-AMC.

6.2.2 Extraction

Typical Extraction sequence:

1. Pull the module handle out ½ way
    a. Blue LED starts “Short Blink” (Hot Swap Negotiation in progress)
    b. Blue LED turns “ON” (Module is ready to be extracted)
2. Loosen the screws of the front plate
3. Pull the module handle out completely and extract the µRTM from the slot.

6.3 Flat Cable Connector Placement

All flat cable connectors onboard the TAMC002-TM are aligned in a 2.54mm grid. This allows for easy test setup creation using hole matrix boards.

Screw holes for fastening the test setup with the TAMC002-TM are present in the 2.54mm grid as well.

All actual dimensions are presented in the following figure. The pins with number 1 are marked red:

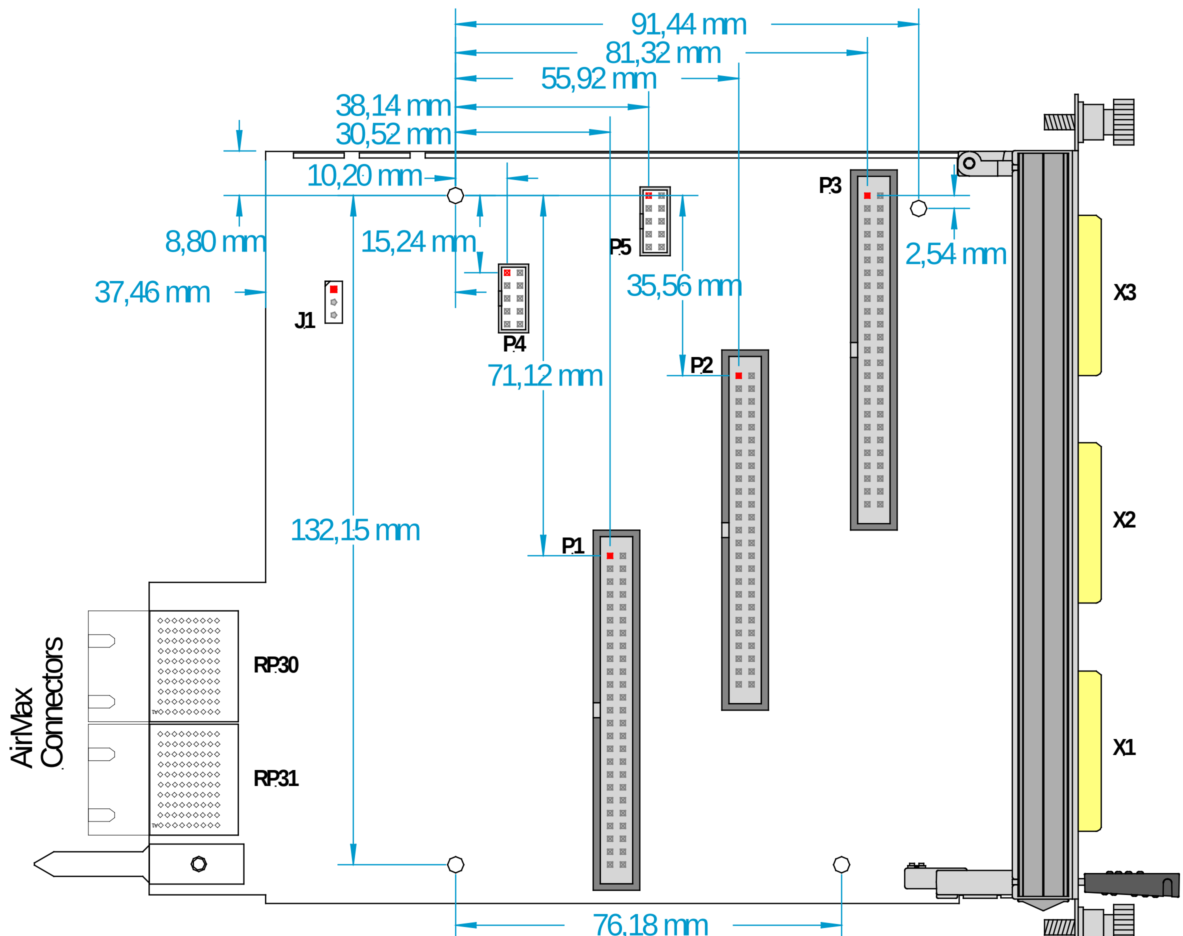
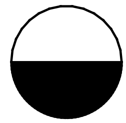


Figure 6-2 : Flat Cable Connector Placement

6.4 Zone 3 Keying

The TAMC002-TM provides the following male keying pin:

N	A Rotation	View	Voltage Levels
5	180	 View into the rear of the Front-AMC white = clearance	Dependent on IP Modules, but >±10V

7 Indicators

7.1 LED Indicators

7.1.1 Front Panel LEDs

For a quick visual inspection, the TAMC002-TM provides the following front panel LEDs:

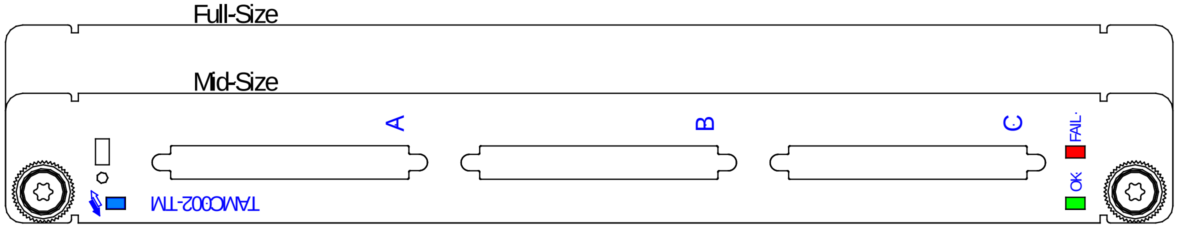


Figure 7-1 : Front Panel LED View

LED	Color	State	Description
HS	Blue	Off	No Power or µRTM is ready for normal operation
		Short Blink	Hot-Swap negotiation (extraction)
		Long Blink	Hot-Swap negotiation (insertion)
		On	µRTM is ready to attempt activation by the system or µRTM is ready to be extracted
FAIL	Red	Off	No fault
		On	Failure or out of service status
OK	Green	Off	µRTM is not powered up
		On	µRTM is powered and OK

Table 7-1 : Front Panel LED (controlled by the MMC of the Front-AMC)

8 I/O Connectors

8.1 Overview

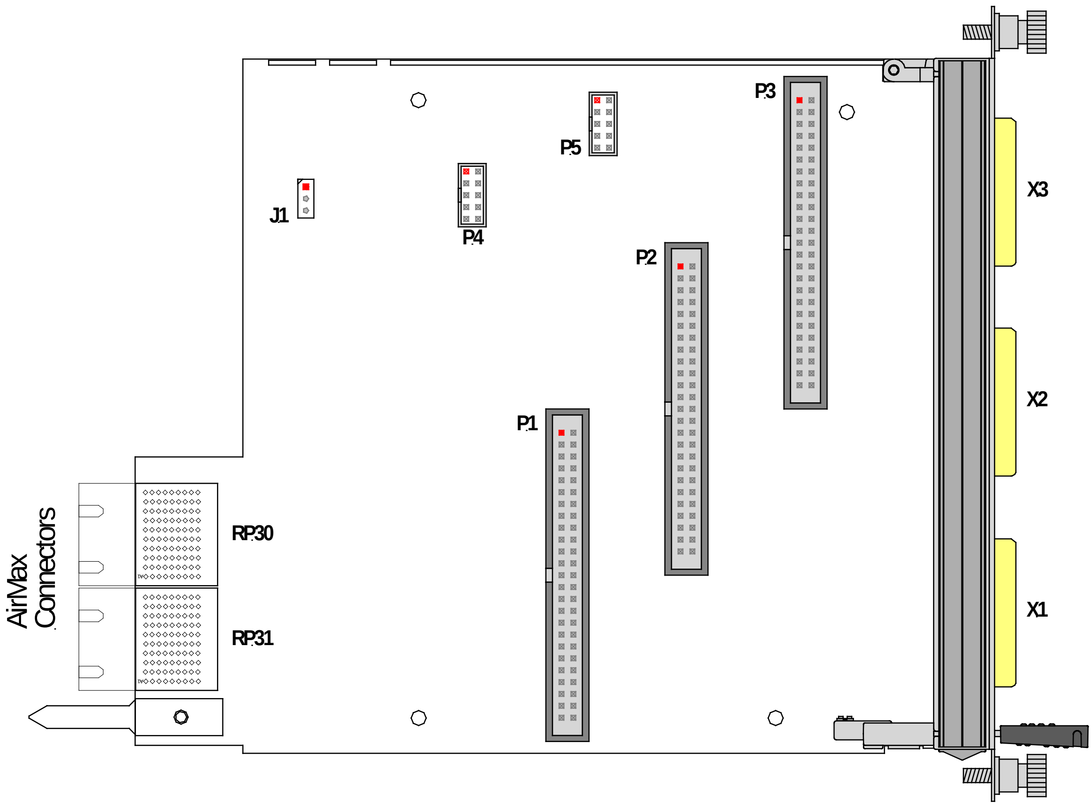


Figure 11-1: Board Connectors and Headers

ID	Description
RP30	MTCA.4 Rear-I/O and Management Signals Connector
RP31	MTCA.4 Rear-I/O Connector
P4	µRTM_PWR Header
P5	TCLKA / TCLKB + PGOOD_EXT Header
J1	Power Good Signal Jumper
P1	IP Slot A I/O Flat Cable Connector
X1	IP Slot A I/O VHD68 Front Panel Connector
P2	IP Slot B I/O Flat Cable Connector
X2	IP Slot B I/O VHD68 Front Panel Connector
P3	IP Slot C I/O Flat Cable Connector
X3	IP Slot C I/O VHD68 Front Panel Connector

Table 11-1: Board Connectors and Headers

8.2 Board Connectors

8.2.1 IP x I/O Front Panel Connectors (x = A, B, C)

Pin-Count	68
Connector Type	VHDCI Female 68pos. 0.8mm spacing
Source & Order Info	HDRA-EC68LFDT-SL+ (Honda)
Location	Front plate

Pin Assignment						
Pin	**Description**	**Note**		**Pin**	**Description**	**Note**
1	IO_x_01	0.3A max		**26**	IO_x_26	0.3A max
2	IO_x_02	0.3A max		**27**	IO_x_27	0.3A max
3	IO_x_03	0.3A max		**28**	IO_x_28	0.3A max
4	IO_x_04	0.3A max		**29**	IO_x_29	0.3A max
5	IO_x_05	0.3A max		**30**	IO_x_30	0.3A max
6	IO_x_06	0.3A max		**31**	IO_x_31	0.3A max
7	IO_x_07	0.3A max		**32**	IO_x_32	0.3A max
8	IO_x_08	0.3A max		**33**	IO_x_33	0.3A max
9	IO_x_09	0.3A max		**34**	IO_x_34	0.3A max
10	IO_x_10	0.3A max		**35**	IO_x_35	0.3A max
11	IO_x_11	0.3A max		**36**	IO_x_36	0.3A max
12	IO_x_12	0.3A max		**37**	IO_x_37	0.3A max
13	IO_x_13	0.3A max		**38**	IO_x_38	0.3A max
14	IO_x_14	0.3A max		**39**	IO_x_39	0.3A max
15	IO_x_15	0.3A max		**40**	IO_x_40	0.3A max
16	IO_x_16	0.3A max		**41**	IO_x_41	0.3A max
17	IO_x_17	0.3A max		**42**	IO_x_42	0.3A max
18	IO_x_18	0.3A max		**43**	IO_x_43	0.3A max
19	IO_x_19	0.3A max		**44**	IO_x_44	0.3A max
20	IO_x_20	0.3A max		**45**	IO_x_45	0.3A max
21	IO_x_21	0.3A max		**46**	IO_x_46	0.3A max
22	IO_x_22	0.3A max		**47**	IO_x_47	0.3A max
23	IO_x_23	0.3A max		**48**	IO_x_48	0.3A max
24	IO_x_24	0.3A max		**49**	IO_x_49	0.3A max
25	IO_x_25	0.3A max		**50**	IO_x_50	0.3A max
			51 – 68	NC		

Table 8-1 : IP I/O Connectors (Front Panel)

8.2.2 IP x I/O Flat Cable Connectors (x = A, B, C)

Pin-Count	50
Connector Type	Flat Cable Connector
Source & Order Info	AMP 104340

Pin Assignment				
Pin	**Description**		**Pin**	**Description**
1	IO_x_01		**26**	IO_x_26
2	IO_x_02		**27**	IO_x_27
3	IO_x_03		**28**	IO_x_28
4	IO_x_04		**29**	IO_x_29
5	IO_x_05		**30**	IO_x_30
6	IO_x_06		**31**	IO_x_31
7	IO_x_07		**32**	IO_x_32
8	IO_x_08		**33**	IO_x_33
9	IO_x_09		**34**	IO_x_34
10	IO_x_10		**35**	IO_x_35
11	IO_x_11		**36**	IO_x_36
12	IO_x_12		**37**	IO_x_37
13	IO_x_13		**38**	IO_x_38
14	IO_x_14		**39**	IO_x_39
15	IO_x_15		**40**	IO_x_40
16	IO_x_16		**41**	IO_x_41
17	IO_x_17		**42**	IO_x_42
18	IO_x_18		**43**	IO_x_43
19	IO_x_19		**44**	IO_x_44
20	IO_x_20		**45**	IO_x_45
21	IO_x_21		**46**	IO_x_46
22	IO_x_22		**47**	IO_x_47
23	IO_x_23		**48**	IO_x_48
24	IO_x_24		**49**	IO_x_49
25	IO_x_25		**50**	IO_x_50

Table 8-2 : X1, X2, X3 I/O Connectors (onboard flat cable connectors)

8.2.3 Power Good Jumper

The Power Good Jumper is used to select the power good signal source. This can either be the TAMC002-TM internal power good generation, which is essentially a pull-up resistor to µRTM_MP, or an external power good signal. If µRTM_PWR is used to generate external voltages (e.g. on an external test setup), the user has to take care of a correct power good signal.

The jumper is labeled in order to find position 1 more easily.

Jumper Configuration	Description
No jumper plugged	not allowed
Jumper in Pos. 1-2	Internal Power Good Signal
Jumper in Pos. 2-3	External Power Good Signal

Table 8-3 : Power Good Signal Jumper

8.2.4 µRTM_PWR Header

µRTM_PWR and GND are available on a 10-pin header to be used for external test setups. If µRTM_PWR is used to generate external voltages, the user has to take care of a correct power good signal. The external power good signal is located on the TCLKA/TCLKB Header.

The flat cable header is labeled onboard to recognize the signals more easily.

Pin	Signal
1 (square pad)	µRTM_PWR
2	GND
3	µRTM_PWR
4	GND
5	µRTM_PWR
6	GND
7	µRTM_PWR
8	GND
9	µRTM_PWR
10	GND

Table 8-4 : µRTM_PWR Header

8.2.5 TCLKA/TCLKB + PGOOD_EXT Header

TCLKA / TCLKB and their respective DIRECTION signals are available on a 10-pin header to be used for external test setups.

The external power good signal is also located on this header.

The flat cable header is labeled onboard to recognize the signals more easily.

Pin	Signal	I/O	Description
1 (square pad)	GND		
2	GND		
3	TCLKA	I/O	See chapter "Functional Description" for details about signal standard and
4	TCLKB	I/O	
5	TCLKA_DIR	I/O	
6	TCLKB_DIR	I/O	
7	GND		
8	GND		
9	GND		
10	PGOOD_EXT	I	TTL Level Signal, indicates the status of external power supplies: 1 = POWER OK 0 = POWER NOT OK

Table 8-5 : TCLKA/TCLKB + PGOOD_EXT Header

If µRTM_PWR is used to generate external voltages, the user has to take care of a correct power good signal.

8.2.6 RP30

Pin-Count	90
Connector Type	FCI AirmaxVS®, Male
Source & Order Info	FCI 10034249-101LF (without Short-Pin) FCI 10034249-111LF (with Short-Pin)

Pin Assignment									
	I	**H**	**G**	**F**	**E**	**D**	**C**	**B**	**A**
1	IO_C_26	IO_C_01	PWR	GND	PWR	IO_C_27	IO_C_28	IO_C_02	IO_C_03
2	IO_C_29	IO_C_30	GND	PWR	PWR	IO_C_04	IO_C_05	IO_C_31	IO_C_32
3	IO_C_06	IO_C_07	PWR	GND	PWR	IO_C_33	IO_C_34	IO_C_08	IO_C_09
4	IO_C_35	IO_C_36	GND	PWR	PWR	IO_C_10	IO_C_11	IO_C_37	IO_C_38
5	IO_C_12	IO_C_13	MP	GND	SCL	IO_C_39	IO_C_40	IO_C_14	IO_C_15
6	IO_C_41	IO_C_42	GND	SDA	PS#	IO_C_16	IO_C_17	IO_C_43	IO_C_44
7	IO_C_18	IO_C_19	TCLKA	GND	TDO***)**	IO_C_45	IO_C_46	IO_C_20	IO_C_21
8	IO_C_47	IO_C_48	GND	TCLKA_DIR	TDI***)**	IO_C_22	IO_C_23	IO_C_49	IO_C_50
9	IO_C_24	IO_C_25	TCLKB	GND	TCK***)**	IO_B_26	IO_B_01	IO_B_27	IO_B_28
10	IO_B_02	IO_B_03	GND	TCLKB_DIR	TMS***)**	IO_B_29	IO_B_30	IO_B_04	IO_B_05

Table 8-6 : RP30 Pin Assignment

***)** = The TAMC002-TM has no JTAG capable devices onboard; it just connects TDI with TDO, so that it does not break the TAMC220 JTAG chain. TCK and TMS are left unconnected.

8.2.7 RP31

Pin-Count	90
Connector Type	FCI AirmaxVS®, Male
Source & Order Info	FCI 10034249-101LF (without Short-Pin) FCI 10034249-111LF (with Short-Pin)

	I	H	G	F	E	D	C	B	A
1	IO_B_31	IO_B_32	IO_B_06	IO_B_07	IO_B_33	IO_B_34	IO_B_08	IO_B_09	IO_B_35
2	IO_B_36	IO_B_10	IO_B_11	IO_B_37	IO_B_38	IO_B_12	IO_B_13	IO_B_39	IO_B_40
3	IO_B_14	IO_B_15	IO_B_41	IO_B_42	IO_B_16	IO_B_17	IO_B_43	IO_B_44	IO_B_18
4	IO_B_19	IO_B_45	IO_B_46	IO_B_20	IO_B_21	IO_B_47	IO_B_48	IO_B_22	IO_B_23
5	IO_B_49	IO_B_50	IO_B_24	IO_B_25	IO_A_26	IO_A_01	IO_A_27	IO_A_28	IO_A_02
6	IO_A_03	IO_A_29	IO_A_30	IO_A_04	IO_A_05	IO_A_31	IO_A_32	IO_A_06	IO_A_07
7	IO_A_33	IO_A_34	IO_A_08	IO_A_09	IO_A_35	IO_A_36	IO_A_10	IO_A_11	IO_A_37
8	IO_A_38	IO_A_12	IO_A_13	IO_A_39	IO_A_40	IO_A_14	IO_A_15	IO_A_41	IO_A_42
9	IO_A_16	IO_A_17	IO_A_43	IO_A_44	IO_A_18	IO_A_19	IO_A_45	IO_A_46	IO_A_20
10	IO_A_21	IO_A_47	IO_A_48	IO_A_22	IO_A_23	IO_A_49	IO_A_50	IO_A_24	IO_A_25

Table 8-7 : RP31 Pin Assignment